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ABSTRACT

A factor validity study of the Learning Style Profile (LSP) developed by the National Association of Secondary School Principals was conducted. Developed for use with students in grades 6 through 12, the Profile, which consists of 26 questions representing 24 independent subscales, requires approximately 60 minutes to finish. A random sample of 937 undergraduate college students completed the LSP. Exploratory factor analysis (maximum likelihood estimation) using the Varimax rotation method was conducted. Results from the 24 factors explained 44% of the total variance. Evidence of validity (factorial) is presented for 21 subscales, but there was none for the subscales "analytical skill" and "spatial skill," and only marginal evidence for the scale "perceptual response." (Contains 4 tables and 17 references.) (Author/SLD)

Running Head: FACTOR VALIDITY STUDY OF THE LEARNING STYLE PROFILE

Factor Validity Study of the Learning Style Profile

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Abstract

A factor validity study of the Learning Style Profile was conducted. Developed for use with sixth-through twelfth-grade learners, the Profile consists of 126 questions representing 24 independent subscales. The Profile requires approximately 60 minutes to finish. A random sample of 937 undergraduate college students completed a Learning Style Profile (LSP). Exploratory factor analysis (Maximum Likelihood Estimation) using the Varimax rotation method was conducted. Results from the 24 factors explained 44.9% of the total variance. Evidence of validity (factorial) is presented for 21 subscales, none for the subscales 'analytic skill' and 'spatial skill', and only marginal evidence for the subscale 'perceptual response.

Factor Validity Study of the Learning Style Profile

One of the most reliable and effective means of improving a student's self-awareness involves the use of learning style and/or cognitive style assessment tools. The usefulness of the learning style concept and various diagnostic approaches has been demonstrated in terms of student achievement, the inhibiting of dropout rates, and increasing students' satisfaction with instruction (Cross, 1983). Institutions are also seeking strategies for attracting, retaining, and ensuring the success of students (Brown, 1986, Carney & Hopperstead, 1986, Pascarella, 1986). Given the unprecedented rise in the number of academically unprepared students who enter universities, learning style assessment programs may hold great promise (Green & Parker, 1989).

Learning style assessment has shown promise in two areas: (1) matching students with instructors who teach to the student's preferred learning style, and (2) identification and remediation of students' learning deficiencies (Green & Parker, 1989). While research into the psychological and affective aspects of learning styles has paid dividends, practical problems temper the enthusiasm because it is difficult to match a student with a specific teaching style all of the time (Duckwall, Arnold, & Haynes, 1990). For example, a freshman in college may be able to choose from a wide variety of instructors for freshman level courses; however, once the student enters a specific program the number of professors from which to choose dwindles. In response, adaptionists, who argue that students should possess the skills necessary to learn in most environments, are now gaining more attention.

The primary emphasis of adaptionist research is in the area of cognition--the cognitive aspects of learning. The work of Witken (1971, 1975), Letteri (1980, 1982), and others exemplifies this approach. Their primary purpose was to identify the areas of academic deficiencies (poor analytic skills, discriminant skills) in students and provide programs to

improve them. Ideally, the prepared student would be able to succeed in almost any learning environment. Using a cognitive style approach to learning style assessment, Duckwall, Arnold and Hayes (1990) discovered that success in medical school was related to specific cognitive abilities. They concluded that students should be tested for specific academic abilities required by the program, and if the student does not possess the necessary proficiencies, remediation programs could be developed.

To date, most learning style assessment tools examine the affective and psychological realms of learning. In response to the growing evidence that cognition plays an important role in the learning environment, some researchers have developed cognitive assessment instruments.

One cognitive/learning style instrument gaining much attention is the Learning Style Profile. Developed by the National Association of Secondary School Principals, the Profile's intended audience is sixth through twelfth grade students. A very comprehensive instrument, the Profile is the only learning style assessment tool that attempts to reconcile both cognitive and learning style preferences with human information processing (Keefe & Monk, 1988). Normed on sixth-through twelfth-grade students, the Profile may be a valuable learning style assessment tool for other populations, namely undergraduate college students, who also require an understanding of their learning preferences.

To date, little validity and reliability data exists for the Learning Style Profile on undergraduate college students. If the Profile proves to be an effective instrument with college-age populations, the rewards would be striking. For example, higher education institutions could use the Profile in university study courses to teach their students how to cope with the institution's unique learning environments, and individual students could determine if deficiencies exist within their unique learning/cognitive styles and seek remediation.

The Learning Style Profile

The Learning Style Profile's revised edition (1989) served as the data collection instrument. Developed for use with sixth-through twelfth-grade learners, the Profile consists of 126 questions representing 24 independent subscales. The Profile requires approximately 60 minutes to finish. The Profile's technical manual reports strong concurrent validity and reliability estimates (Cronbach's alpha) ranging from 0.47 to 0.86. The Learning Style Profile is intended as only a first-level diagnostic tool; as such, it is recommended that once problematic areas are identified, additional testing should commence. The scale definitions and number of items are presented in Table 1.

Method

The Profile's technical manual reports that the Profile consists of 24 independent subscales. To determine if this holds true for a different population (undergraduate college students), the following research question was developed:

> Will the Learning Style Profile exhibit 24 factors: 7 cognitive skill factors, 3 perceptual response factors, and 14 study and instructional preference factors?

In the Fall Semester, 1996, a random sample of undergraduate college students attending a southern land grant university were asked to complete a Learning Style Profile (LSP). Students were identified as potential participants if they were pursuing a BS/BA degree, were enrolled for a minimum of 6 semester hours, and did not possess a bachelor's degree. Working with the registrars' office, attempts were made to select students representative of the universities' undergraduate population. The LSP was administered to students in group settings. The process was entirely voluntary and no course credit or other remuneration was given for participation.

The protocol for the Profile's administration was as follows. Subjects were told that this was a research project, all information was confidential, and participation was entirely voluntary.

Students were given a demographic answer sheet and asked to provide basic descriptive information. Descriptive information collected included age, sex, ethnicity, class rank (freshman, sophomore, etc.), college where student is seeking a degree (engineering, arts and sciences, etc.), if they were enrolled in six or more credit hours for fall semester, and if they possessed a diagnosed learning disability. After the demographic information was collected the Learning Style Profile was handed out and directions for administering the Profile given in the Learning Style Profile Examiner's Manual were followed.

To ascertain if 24 independent subscales exist on the LSP relevant for undergraduate college students exploratory factor analysis using the Varimax rotation method was conducted. A .30 factor-loading criterion was employed to identify the 24 factors. Internal consistency reliability for each subscale was also calculated.

Results

Nine hundred and thirty-seven undergraduate college students completed a Learning Style Profile (LSP). One hundred and twenty-three were removed from the data analysis because of missing or incomplete data. Therefore, eight hundred and fourteen students formed the sample for all statistical analysis. The mean age of subjects was 23, with the oldest being 58 and the youngest 17. All subjects were enrolled in traditional BS/BA programs.

Over 60 percent of the subjects were female (60.4 %) and most subjects were enrolled in programs in the college of arts and science (381), followed by education (144) and business (107). Seventy-one students were still deciding their course of study. Whites (59.8%) constituted the majority of subjects who completed profiles; however, Hispanics, Asian Americans and African Americans were represented. Table 2 contains subjects' qualitative information.

Score Analysis

The descriptive statistics mean, standard deviation, kurtosis, skewness, standard error, and alpha were calculated on the raw data for each subscale. The LSP's median internal consistency, as measured by Cronbach's Alpha was .65 with estimates ranging from .84 for lighting preference to .14 for spatial skill. Using a reliability coefficient of .40 as a guide, four subscales possess low reliability estimates. They are categorization skill (.38), analytic skill (.23), spatial skill (.14), and grouping preference (.37). Results are presented in Table 3.

To ascertain if 24 independent subscales exist on the LSP relevant for undergraduate college students exploratory factor analysis (Maximum Likelihood Estimation) using the Varimax rotation method was conducted. Results from the 24 factors explained 44.9% of the total variance. Table 4 provides results from the factor analysis procedure. Twenty-nine items did not load on a factor and no evidence or factors were identified for the subscales spatial skill and analytic skill. Of additional interest, three factors were identified as memory skill, study time preference is comprised of items designed to measure evening (negative loading items) and early morning study time preferences (positive loading items), two factors were identified as perceptual response and two factors were defined as sound preference.

Discussion

The purpose of this study was to gather evidence of validity for the Learning Style Profile with undergraduate college students. Nunnally & Bernstein (1994) argue that it is appropriate to employ factor analysis to define internal structures and cross structures for sets of variables in construct validity. Based on the results, evidence of validity (factorial) is presented for 21 subscales, none for the subscales 'analytic skill' and 'spatial skill', and only marginal evidence for the subscale 'perceptual response.'

The perceptual response subscales 'washed-out' in the common factor solution as only two factors (20 and 24) were defined as perceptual response. This may indicate that the LSP cannot differentiate between the three types of perceptual response to learning. Keefe & Monk, (1988) declared that perceptual response subscales, more than any other, fragment in factor analysis. This is due to the fact that all three subscales are drawn from the same 20 questions, termed 'item overlap'. Nunnally & Bernstein (1994) indicate that if two scales share items they will have built in correlation, and that the factor structures will reflect item overlap rather than the content of the responses.

Results of the study also indicate that a new learning style paradigm described by a variety of components may be a legitimate proposition. Following the work of Letteri (1980), evidence is accumulating that indicates it is possible to measure the cognitive functions of adults (Sisco, 1987; Yu, 1991; Glade, 1993). As such, administrators, faculty and adult students may now have the components from which to design a more thorough and rigorous learning style assessment.

As evidence of validity and reliability accumulate for the Learning Style as a composite of cognitive skills, perceptual responses, study and instructional preferences, more disciplines may take interest. It is possible, as Keefe & Monk (1988) argue that learning style research will be brought more into the mainstream of psychology, neuroscience, and related areas of cognitive science. The outcomes may possibly be the melding of issues relating to attention, motivation, knowledge acquisition, representation and use, and cognitive development. Whereby, a more rigorous model and instrument for measuring learning style will be developed.

Conclusion

The results of the study indicate that learning-to-learn practitioners and theorists may have an instrument to aid them in the assessment of learner's needs. Such a comprehensive instrument can only strengthen the intricate relationship between learner's needs, learning style and training. This is at the core of learning-to-learn because the learner needs to know both about their learning strength and weaknesses as well as the demands and required competencies of the program in order to train for improved learning performance.

Specific applications include college administrators, who could stress the importance learning style assessment and build a climate of acceptance for it. Program developers and counselors could provide learning style assessment training and build the LSP into program activities and counseling. University faculty could incorporate sections of the LSP in their courses. In this way, instructors could become aware of the learning style differences in the student body and possibly adjust or vary their teaching strategies. While it may be impossible to teach to every student's learning style, presenting the information in alternate ways could certainly assist in meeting the diverse learning needs of students.

The LSP demonstrated promise for use with college students. Nevertheless, this is only a first step in the development of an instrument capable of measuring the 24 independent constructs. Additional research should be conducted. Furthermore, the LSP is only intended as a first-level diagnostic instrument. Specific attention should involve the development of secondary instruments to validate the LSP's findings.

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Table 1

Learning Style Profile Subscales and Definitions

Subscale	Number of Items	Definition
Analytic Skill	5	The analytic skill subscale (AS) is modeled after the Embedded Figures Test (EFT). Scores range from 0 (weak) to 5 (strong).
Spatial Skill	5	The spatial skills subscale includes two components of general spatial reasoning: (1) pattern recognition and (2) spatial rotation. Scores range from 0 (weak) to 5 (strong).
Discrimination Skill	5	The subscale measures a student's ability to focus on the important elements of the task. Scores range from 0 (weak) to 5 (strong).
Categorization Skill	8	The categorization skill subscale is based on the notion of 'equivalence range. Equivalence range can be subdivided into groups: (1) narrow and (2) broad categorizers. Scores range from 0 (weak) to 24 (strong).
Simultaneous Processing	5	Simultaneous processing is the synthesis of separate elements into groups. Scores range from 0 (weak) to 5 (strong).
Sequential Processing	6	Sequential processing is defined as the processing of information in serial order. Scores range from 0 (weak) to 6 (strong).
Memory Skill	12	The subscale is a variation on a series of tests designed to assess the cognitive control of leveling versus sharpening. Scores range from 0 (weak) to 12 (strong).
Verbal-Spatial Preference	6	The verbal-spatial preference subscale elicits the subject's preference for verbal or spatial meaning. Scores range from 0 (high spatial) to 5 (high verbal).
Manipulative Preference	4	Preference for hand-on activities. Scores range from 4 (low) to 20 (high).

(table continues)

Perceptual	20	The perceptual response subscales are patterned after the
Response	20	Edmonds Learning Style Indicator (ELSIE).
Visual	20	Scores range from 0 (weak) to 20 (strong).
Auditory		Scores range from 0 (weak) to 20 (strong).
Emotive		Scores range from 0 (weak) to 20 (strong).
Verbal Risk Orientation	4	The verbal risk orientation subscale measures a student's willingness to verbalize, state opinions, and to state opinions even if others disagree. Scores range from 4 (low) to 20 (high).
Grouping Preference	5	The grouping preference subscale is composed items that identify a learner's preference for whole class, small group or dyadic instruction. Scores range from 5 (small) to 25 (large).
Persistence Orientation	4	The persistence orientation subscale uses items to assess a student's willingness to work at difficult tasks until completion. Scores range from 4 (low) to 20 (high).
Study Time Preference		Study time preferences are individual variations in learning readiness and attention related to the different times of the day.
Early morning	2	Scores range from 2 (low) to 10 (high).
Late morning	2	Scores range from 2 (low) to 10 (high).
Afternoon	3	Scores range from 3 (low) to 15 (high).
Evening	3	Scores range from 3 (low) to 15 (high).
Posture Preference	4	The posture preference subscale assesses the learner's choice of formal vs. informal study arrangements. Scores range from 4 (informal) to 5 (formal).
Mobility Preference	4	The mobility preference subscales assess a learner's tendency to move about and take breaks while studying, or to work in place until finished. Scores range from 4 (stillness) to 20 (movement).

(table continues)

Sound Preference	4	The sound preference subscale measures a student's reaction to auditory stimuli. Scores range from 4 (quiet) to 20 (sound).
Lighting Preference	5	The lighting preference subscale assesses a learner's preference for high or low levels of illumination for studying or thinking. Scores range from 5 (dim) to 25 (bright).
Temperature Preference	4	The temperature preference subscale assesses a learner's preference of cool or warm study environments. Scores range from 4 (cool) to 20 (warm).

Table 2

Qualitative Information of Subjects

Variable	Frequency	Frequency Percent	Cumulative Frequency
College			
Business	107	13.1%	13.1%
Education	144	17.7%	30.8%
Health Sciences	78	9.6%	40.4%
Arts & Sciences	381	46.8%	87.2%
Agriculture	6	0.7%	88.0%
Engineering	27	8.7%	91.3%
Other*	71	8.7%	100.0%
Ethnicity			
Asian Americans	75	9.2%	9.2%
African Americans	71	8.7%	17.9%
Hispanics	140	17.2%	35.1%
Native Americans	7	0.9%	36.0%
Whites	483	59.3%	95.3%
Other**	38	4.7%	100.0%
Enrollment Year			
Freshmen	172	21.1%	21.1%
Sophomore	138	17.0%	38.1%
Junior	210	25.8%	63.9%
Senior	294	36.1%	100.0%

*Other refers to undecided

**Other primarily refers to Pacific Islanders, people undecided or unwilling to furnish this information

Table 3

Descriptive Statistics for Each Subscale

Subscale	Mean	SD	Kurtosis	Skewness	S.E.	Alpha
Sequential Processing	5.50	0.98	7.29	2.61	0.03	.47
Discriminant Skill	2.45	1.15	0.86	0.27	0.04	.61
Simultaneous Processing	4.60	0.87	5.67	2.45	0.03	.41
Categorization Skill	9.37	4.67	0.72	0.07	0.17	.38
Analytic Skill	3.43	1.36	1.08	0.41	0.05	.23
Spatial Skill	3.44	1.23	0.76	0.44	0.04	.14
Memory Skill	6.12	2.66	0.69	0.09	0.10	.73
Persistent Orientation	14.42	2.45	0.12	0.10	0.09	.71
Verbal Risk	12.61	2.86	0.30	0.08	0.10	.65
Manipulative Preference	12.79	3.18	0.37	0.12	0.11	.74
Visual	9.74	3.14	0.62	0.31	0.11	.57
Auditory	3.32	2.47	3.37	1.28	0.09	.58
Emotive	6.79	2.60	0.60	0.23	0.09	.60
Early Morning	5.61	1.75	0.27	0.08	0.06	.65
Late Morning	6.06	1.81	0.36	0.02	0.06	.80
Afternoon	10.43	1.84	0.61	0.54	0.06	.65
Evening	9.69	2.52	0.35	0.22	0.09	.75
Verbal-Spatial Preference	3.31	1.31	0.54	0.14	0.04	.47
Grouping Preference	15.40	2.11	1.01	0.32	0.07	.37

Table 3 Continued

Descriptive Statistics for Each Subscale

Subscale	Mean	SD	Kurtosis	Skewness	S.E.	Alpha
Mobility Preference	12.94	2.88	0.30	0.05	0.11	.69
Sound Preference	9.87	3.39	0.52	0.17	0.12	.77
Light Preference	16.44	4.12	0.29	0.24	0.15	.84
Posture Preference	13.98	2.86	-0.48	-0.02	0.10	.64
Temperature Preference	10.50	3.31	0.23	0.33	0.12	.82

Table 4
Factor Analysis—Twenty Four Factor Solution
(N=814) (44.96 total variance explained)

Factor	1	2	3	4	5	6	7	8	9	10	11	12
EIGEN	5.0	4.4	4.0	3.4	3.3	2.8	2.7	2.5	2.3	2.2	2.1	2.0
% of Var.	4.0	3.5	3.2	2.7	2.6	2.2	2.2	2.0	1.9	1.8	1.7	1.6
Item												
67	.81	(Light Preference)										
69	.79											
98	.77											
80	.66											
61	.59											
89		.85	(Late Morning Study Time)									
93		.62										
64			-.85	(Manipulative Preference)								
82			-.76									
73			-.67									
102			-.37									
81				.74	(Sound Preference)							
71				.72								
83					.83	(Grouping Preference)						
70					.77							
99					.51							
90					.49							
65					.37							
85						.83	(Temperature Preference)					
96						.78						
63						.74						
88						.69						
91							.77	(Persistence Orientation)				
84							.76					
74							.51					
68							.50					
113								.50	(Memory Skill-1)			
117								.46				
125								.43				
122								.42				
111								.40				
115								.31				
78									.85	(Sound Preference)		
101									.79			
65	(Grouping Preference)									.78		
99										.58		
77	(Study Time Preference –evening and early morning)									.76		
62											.72	
66											.64	
106											-.59	
93											-.46	
72											-.45	
89											-.35	
95	(Verbal RisK)											.62
92												.59
107												.55
75												.54

(table continues)

Table 4
Factor Analysis—Twenty Four Factor Solution
(N=814) (44.96 total variance explained)

Factor	13	14	15	16	17	18	19	20	21	22	23	24
EIGEN	1.9	1.8	1.8	1.7	1.7	1.6	1.6	1.5	1.4	1.4	1.4	1.3
% of Var.	1.5	1.4	1.4	1.4	1.3	1.3	1.2	1.2	1.1	1.1	1.1	1.0
Item												
11	.61	(Discriminant Skill)										
8	.57											
9	.54											
7	.47											
10	.44											
79		.65	(Posture Preference)									
87		.59										
97		.51										
105		.45										
14			-.712	(Simultaneous Processing Skill)								
12			-.506									
16			.466									
13			.363									
15			.358									
19				.62	(Categorization Skill)							
20				.55								
21				.45								
76					.70	(Mobility Preference)						
108					.63							
103					-.62							
86					-.47							
4						.55	(Sequential Processing Skill)					
2						.54						
6						.50						
56							.48	(Perceptual Response)				
52							.47					
55							.44					
47							.36					
50							.34					
104								-.69	(Afternoon Study Time)			
100								-.60				
94								-.46				
120									-.67	(Memory Skill-2)		
118									-.65			
123									-.39			
112									-.34			
126	(Memory Skill-3)									.63		
124										.58		
121										.42		
114										.36		
119										.33		
112										.30		
34	(Verbal-Spatial Preference)										-.49	
30											-.48	
33											-.33	
57	(Perceptual Response)										.44	
58												.42
60												.40
54												.40
53												.39

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